TO:	Mr. Carl P. Garvey and Mr. M. Brendan Mullen (Revitalizing Auto Communities Environmental Response Trust) Mr. Alan J. Knauf and Ms. Linda R. Shaw (Knauf Shaw LLP)
FROM:	Katherine Lasseter, Jason Dittman, Jamie Combes, and Jill DeMars (TIG Environmental) 443 North Franklin Street, Suite 220, Syracuse, NY 13204
SUBJECT:	**Evidence Summary Memorandum for Lennox Site**
DATE:	October 2, 2019

1. Introduction

Revitalizing Auto Communities Environmental Response (RACER) Trust and Knauf Shaw LLP (Knauf Shaw) contacted TIG Environmental[1] to provide consulting services regarding potentially responsible party (PRP) identification and investigation, sampling and data analysis, and expert witness testimony to support RACER Trust and Knauf Shaw during litigation proceedings stemming from a Civil Action No.: 5:18-cv-1267 [DNH/ATB] filed on October 26, 2018 (the Complaint) (RACER 2018).

In the Complaint, RACER Trust, by its attorneys, Knauf Shaw LLP, brings claims for cost recovery and contribution under Sections 107(a) and 113(f) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 42 U.S.C. 9607(a) and 9613(f), inter alia, against parties (Defendants) operating in or around the Ley Creek Watershed Site (Study Area) in Onondaga County, New York. The Complaint asserts that the Defendants are responsible to contribute to the cost of past and future investigations to address contamination in and around the Study Area.

The Study Area consists of the GM-Inland Fisher Guide Facility (GM-IFG) Sub-Site Operable Unit 1 (OU-1), the expanded OU-2 area (Ley Creek from Townline Road west to Route 11, including creek banks and limited floodplain and hotspot areas), and tributaries upstream of Townline Road bridge. As defined in the Record of Decision (ROD) for OU-2, the identified contaminants of concern (COCs) at the Site are polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), chromium, copper, lead, nickel, and zinc. PCBs are the predominant contaminants in Ley Creek sediments (NYSDEC and EPA 2015).

[1] TIG Environmental is a member of The Intelligence Group, LLC.

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In this evidence summary memorandum (ESM), TIG Environmental reviewed evidence gathered by RACER Trust and Knauf Shaw to evaluate the following for each Defendant's site:

- Documented and suspected PCB usage at the Defendant's site
- The existence of PCB-containing electrical equipment or electrical substations (utility- or Defendant-owned) on Defendant's site
- Whether pathways exist between the Defendant's site and the Ley Creek watershed (defined as Ley Creek and its tributaries)

Sections 2 through 4 summarize the available information on Defendant operations related, or potentially related, to PCB usage; detections of contaminants at or related to the Defendant site; permits, waste handling, spills, and/or releases at each Defendant's site; whether pathways from the Site to Ley Creek watershed can be determined; data gaps; and proposed sampling to address identified data gaps. Defendant information, site ownership information, and dates of operation for the Defendant's site are available in Knauf Shaw's site dossier (Knauf Shaw Lennox Site Dossier).

2. Description of Site Operations Related to PCBs

Lennox Industries Inc., formerly The Lennox Furnace Company (Lennox) operated a furnace manufacturing facility from the early 1900s to about 1967 at approximately 380-400 Midler Ave. The exact end date of operations and subsequent owner(s) are current data gaps. However, available Sanborn maps after 1967 (1971 and 1990) do not indicate site closure activities or removal of site structures (Knauf Shaw Lennox Site Dossier, 1–2; Knauf Shaw Lennox Exhibit B, 1, 3).

Operations at the Lennox Site (the Site) included the following: transformer use, metal fabrication (shaping, cutting, forming), scrap metal operations, and foundry operations. Railroad spurs are also located on the Site. The contaminants of concern (COCs) associated with these operations are summarized below.

Transformer Use

A transformer is visible in the 1990 Sanborn map (Knauf Shaw Lennox Exhibit B, 1). The structure labeled as a transformer in the 1990 Sanborn map is also present in the 1953, 1964, and 1971 Sanborn maps; however, it is not labeled (Knauf Shaw Lennox Exhibit B, 2–4). Available documents do not indicate the use of PCB-containing oils; however, the transformer likely contained PCBs at one time, as it was present at the Site by 1953, and PCBs were available for commercial use from the 1930s through the late 1970s (Erickson and Kaley 2011, 2; Knauf Shaw Lennox Exhibit B, 1–4). Typical PCB Aroclors[2] associated with transformers are Aroclors 1254 and 1260 with minor uses of Aroclors 1242 and 1016 (Erickson and Kaley 2011, 10).

[2] Beginning in 1935, Swann Chemical Company, followed by the Monsanto Company, produced commercially available PCB-containing goods in a line of products known as "Aroclors." Each of the 10 common PCB Aroclor mixtures are generally associated with certain signatures of PCB-congeners (there are 209 PCB congeners) (Erickson and Kaley 2011, 2–3). The style of reporting analytical data for PCBs varies in reviewed documentation. Results may be reported as individual Aroclors and/or congeners, as a sum of all or some of these analytes, or simply as "PCBs." For purposes of this memorandum, TIG Environmental will state "total PCBs" when the source document has reported analytical results as either "PCBs" or "total PCBs." This is presumed to represent the sum of PCB Aroclors or congeners. TIG Environmental will report Aroclor- or congener-specific data where that information is available.

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Metal Fabrication

Site operations included the manufacture of residential furnaces (Knauf Shaw Lennox Site Dossier, 3). The general timeline of Lennox furnace manufacturing as a company is listed below (Lennox 2019):

- **1985:** Lennox began manufacturing riveted steel furnaces
- **1935:** Lennox began manufacturing forced-air furnaces for residential heating
- **Ca. 1940s:** During WWII, Lennox helped manufacture parts for military aircrafts and weapons

The nature of operations conducted at the Site in Syracuse specifically, including the type of furnaces manufactured is a current data gap.

Furnace manufacturing generally includes fabrication of metal products (MadeHow 2019, 1). Gas furnaces originally included a heat exchanger, burner, gas control valve, and external thermostat (MadeHow 2019, 1). Forced air furnaces (which Lennox began manufacturing in 1935) have a cast iron or sectional steel heat exchanger. Forced air furnaces typically had heavy steel interiors and removable panels. A manufacturer, such as Lennox, would typically use a hydraulic press to form the heat exchanger component. Use of a hydraulic press would include the use of hydraulic fluids (MadeHow 2019, 2).

Certain metalworking processes involve cutting, pressing, shearing, rolling, spinning, and bending metal pieces to meet the specifications of the desired fabricated metal product (EPA 1995, 25). These processes require the use of hydraulic and cutting oils (EPA 1995, 25, 35–36, 81; EPA 2004, 68). Hydraulic fluids are typically associated with Aroclors 1232–1260 (Aroclors 1232, 1242, 1248, 1254, 1260) and cutting oils with Aroclor 1254 (Erickson and Kaley 2011, 10). Prior to the 1980s, cutting and hydraulic oils commonly contained PCBs (EPA 1976, 43; Erickson and Kaley 2011, 7, 11). In 1976, the EPA classified use of PCBs in hydraulic fluids as a “nominally closed” application (EPA 1976, 227). Even though hydraulic systems are supposedly closed, the EPA estimated that 60 percent of the PCBs used in such systems were lost to the environment on an annual basis due to spills in the system and inadequate disposal of the PCB-containing materials (EPA 1976, 307).

Painting

Spray booths and/or paint storage areas are depicted on Sanborn maps of the Site between 1953 and 1990 (Knauf Shaw Lennox Exhibit B, 1–4). PCBs are a component of certain industrial coatings and paints (Erickson and Kaley 2011, 12). Paints and coatings containing azo (red-yellow) and phthalocyanine (blue-green) pigments may contain PCB congeners. Up to 50 unique congeners have been detected in these pigments and products that include these pigments (Hu and Hornbuckle 2009, 1, 4). Reviewed documents do not mention how the spray booths were used, nor which specific coatings/paints were stored onsite.

Railroad Spurs

Railroad spurs have existed onsite since at least 1953 (Knauf Shaw Lennox Exhibit B, 4). From the 1940s to the mid-1980s, transformers were used on rail cars (Slater 1996, 21). PCB fluids and electrical equipment were used in railroad systems (USDOT 1984, 25) and the resulting PCB contamination is an issue at railcar maintenance locations and transit yards (Slater 1996, 29). Equipment typically used in railroad systems includes railroad (on-board) transformers and capacitors (Slater 1996, 31). Aroclors 1260 and 1254 are specifically associated with transformers (Erickson and Kaley 2011, 10).

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Foundry Operations

In the 1953 Sanborn map, a portion of the site buildings are labeled as “Genessee Foundry Co.” (Knauf Shaw Lennox Exhibit B, 4). At that time, the Genessee Foundry Co. building included a cupola[3] furnace, pattern shop, foundry, and “foundry addition.” However, exact features of the foundry operation and operating period have not been found in reviewed documents. It is reasonable to conclude that Genesee Foundry Co. would also have conducted operations related to metal fabrication, described in further detail above.

Electric Arc Furnaces

There is no documentation regarding the particular nature of furnaces used by Genessee Foundry Co.; however, PCBs may be generated when recycling scrap metal at a foundry, including when using electric arc furnaces (EAF), a common type of furnace frequently used to melt iron and steel scraps for forming new metal components (Wu et al. 2014, 1). Because scrap materials may contain various amounts of other chlorinated compounds as part of the scrap (such as PVC plastics, cutting oils, industrial coatings, paints), the metals melted in furnaces may generate PCBs (Wu et al. 2014, 1–2). The use of EAFs in foundries for the production of steel results in the generation of contaminants like PCBs and polychlorinated dibenzo-p-dioxin/dibenzofurans (PCDD/Fs) in the dust produced by the furnace that can be transported by aerial emissions (Cappelletti 2016, 2, Aries 2008, 3; Wu et al. 2014, 1–2; Kakareka and Kukharchyk 2005, 5; Dyke 1998, 37). Because the PCBs generated by an EAF are not being intentionally produced, the specific PCB congeners associated with each particular furnace are unknown. Studies of PCBs generated by furnaces and incinerators have identified a wide range of congeners (Dyke 1998, 15, 20–23, 27). Further, because this process is inadvertent, melting of scrap metal in EAFs continues to pose a human health and environmental risk despite the ban on PCB manufacture (Jackson et al. 2011, 1; Cappelletti et al. 2016, 1-2; Kuzu et al. 2013, 3). PCB congeners have also been detected in aerial emissions from coal-fired boilers, meaning that emissions of PCBs are not limited to plants equipped with EAFs (Grochowalski and Konieczyński 2008, 1, 5). Additionally, EAFs are commonly supported by transformers due to the high electricity demand of electric furnaces.

2.1 Discharge Permits, Waste Handling, and/or Spills at the Site

2.1.1 Discharge Permits

No permit information is available for the Site.

2.1.2 Waste Handling Related to PCBs

No waste handling information is available for this Site.

[3] The map labels a small shape as “cupola” and TIG Environmental assumes the label pertains to a cupola furnace but cannot be confirmed at this time.

2.1.3 Spills Related to PCBs

Two spills have been reported in the New York Spills database. Both spills occurred in the early 1990s; the exact end date of Lennox operations and immediate subsequent owner(s) are unknown.

- **May 7, 1990:** Hundreds of gallons (exact volume unknown) of petroleum accumulated on surface water near "Midler & Canal #2."[4] The source of the petroleum is unknown. Reviewed documents do not indicate whether or how this spill was cleaned up (Knauf Shaw Lennox Exhibit A, 30). The responsible entity is not reported.
- **May 16, 1991:** A private citizen reported three 55-gallon drums and three 30-gallon drums containing petroleum products as abandoned at the Site. Reviewed documents do not indicate whether the abandoned drums were cleaned up (Knauf Shaw Lennox Exhibit A, 9). The responsible entity is not reported.

2.2 PCB Discharges to Ley Creek or Tributaries

This section discusses the documented or potential discharge pathways of PCBs from the Site, with emphasis on discharges to Ley Creek or its tributaries.

2.2.1 Direct Discharge

No information is currently available on direct discharge pathways at the Site.

2.2.2 Sanitary Sewer

This section discusses the documented or potential PCB-containing discharges from the Site via sanitary sewers.

- A catch basin is located at the northernmost corner of the property, along N Midler Avenue, just west of the railroad bridge overpass (Google Earth 2018). It is unknown whether the catch basin connects to a storm or combined sewer line.

2.2.3 Storm Sewer

This section discusses the documented or potential PCB-containing discharges from the Site via storm sewers.

- A catch basin is located at the northernmost corner of the property, along N Midler Avenue, just west of the railroad bridge overpass (Google Earth 2018). It is unknown whether the catch basin connects to a storm or combined sewer line.

2.2.4 Runoff

This section discusses the documented or potential PCB-containing discharges from the Site to Ley Creek or its tributaries via stormwater runoff.

- Based on the topography of the Site, runoff would flow to the north, from the Site to Teall Brook which connects to South Branch Ley Creek (USGS 1957, 1). The contents of spills (both reported and

[4] It is unknown whether the "Midler & Canal #2" location is a street, ditch, or location within a surface water body.

unreported) to site soil could have traveled via runoff to South Branch Ley Creek (Knauf Shaw Lennox Exhibit A, 5, 9).

- A water pipe is located along the northern boundary of the Site, running towards Teall Brook. The pipe is visible on Sanborn maps from 1953, 1964, 1971, and 1990 (Knauf Shaw Lennox Exhibit B, 1–4). Teall Brook connects to South Branch Ley Creek; however, the function of the water pipe is unclear (i.e. intake, cooling water transport, etc.).
- Rail spurs on the Site could have potentially functioned as preferential pathways for surface runoff onsite.

2.2.5 Groundwater

No information is currently available on groundwater flow direction or discharge pathways at the Site.

3. Data Gaps

TIG Environmental has identified the following data gaps that would increase the understanding of how PCBs were used onsite and/or released from the Site.

- Subsequent site owners after Lennox and current owners of specific lots that make up the entire Site are currently unknown. This information is useful in understanding the nature of onsite operations following Lennox, and involvement in potential site investigations following Lennox operations.
- The exact operating period is currently unknown. The operating period is critical to understanding the period of potential discharge from the Site to Ley Creek.
- The specific nature of operations (Lennox) and products produced at the Site (Genessee Foundry Co.) is not available. Understanding specific operation processes and products made at the Site is critical in understanding potential PCB sources. Without further site-specific detail on operations, processes, and products, the identification of potential PCB sources in this memo relies on a general understanding of metals manufacturing processes.
- Wastes generated onsite and waste handling practices are unknown. Understanding wastes generated as a result of onsite operations is necessary to determine all potential sources of PCBs onsite.
- Onsite sampling results (soil, groundwater, sediment) are not available. Onsite sampling results are critical to understanding current site conditions, areas of concern, and identifying potential areas for further investigation/characterization.
- A catch basin is located at the northernmost corner of the property, along N Midler Avenue, just west of the railroad bridge overpass. It is unknown whether the catch basin connects to a storm or combined sewer line. Understanding the connection from the catch basin to the sewer would aid in identifying potential discharge pathways from the Site to Ley Creek.

4. Proposed Sampling to Assess Contributions to the Study Area

Because of the data gaps identified in Section 3, TIG Environmental proposes additional sampling at the Site, as described below. The sampling locations should be analyzed for PCB Aroclors (EPA Method

8082A), PCB congeners (EPA Method 1668C), total organic carbon (Lloyd Kahn method), grain size (ASTM D422), and total solids (ASTM D2216-98). In addition to those parameters, TIG Environmental may also propose sampling for particular contaminant classes (that is, metals, PAHs, volatile organic compounds [VOCs], and semivolatile organic compounds [SVOCs]), depending on the nature of operations surrounding a particular sampling location.

4.1 Soil

Soil samples are recommended for PCB, metals, and PAH analysis[5] in the following areas:

- Surrounding building footprints of former foundry (Genessee Foundry Co.) operation areas; two buildings were formerly used as a foundry. Foundry operations are associated with PCBs, PAHs and metals.
- Paint storage shed; the outdoor paint shed potentially stored PCB-containing coatings or industrial paints.

4.2 Sediment

Sediment samples are recommended for PCB, metals, and PAH analysis in the following areas:

- Catch basin located at the northernmost corner of the property should be sampled (catch basin sediment) to understand whether site runoff is a continuing source of PCBs, PAHs, or metals.
- Culvert/inlet along N Midler Avenue opposite of the site driveway/access point, which could serve as a preferential pathway to Teall Brook. Sediment from the culvert, or subsurface sediment in Teall Brook, should be sampled.
- If there are any catch basins onsite, catch basin sediment samples should be collected.
- It appears that there is a drainage swale along the northwestern property line and N Midler Avenue (Google Earth 2018). The property slopes downward toward the street. Soil or sediment samples could be collected from the swale, as it likely receives runoff during high precipitation events.
- Conduct site reconnaissance around water pipe running along northern site boundary and sample sediment within, if feasible.

5. References

This ESM was prepared using the evidentiary materials listed below and provided with this document.

Aries, Eric, Anderson, David R., and Fisher, Raymond. “Exposure Assessment of Works to Airborne PCDD/Fs, PCBs, and PAHs at an Electric Arc Furnace Steelmaking Plant in the UK.” *Annals of Occupational Hygiene* (2006).

[5] Foundry and metalworking operations can be associated with both PAHs and metals, as well as PCBs (Aries et. al 2006, 1–14; Dyke 1998, 5; Cappelletti 2016, 2).

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Cappelletti, Roberto, Ceppi, Marcello, Claudatus, Justina, and Gennaro, Valerio. “Health Status of Male Steel Workers at an Electric Arc Furnace (EAF) in Trentino, Italy.” *Journal of Occupational Medicine and Toxicology* (2016) 11: 7.

Dyke, Patrick H. 1998. *PCB and PAH Releases from Incineration and Power Generation Processes. Environmental Agency.* Bristol: Environment Agency.

EPA (U.S. Environmental Protection Agency). 1976. *PCBs in the United States Industrial Use and Environmental Distribution*. Washington, DC: EPA.

EPA (U.S. Environmental Protection Agency). 1995. *Profile of the Fabricated Metal Products Industry.*

EPA (U.S. Environmental Protection Agency). 2004. *PCB Inspection Manual.*

Erickson, Mitchell D. and Kaley, Robert G. II. “Applications of Polychlorinated Biphenyls.” *Environmental Science and Pollution Research* (2011) 18:135–151.

Google Earth. 2018. “Aerial imagery of the U.S. Hoffman Site.” Map Data: Google Earth. Accessed June 25, 2019. https://www.google.com/earth/.

Grochowalski, Adam and Jan Konieczyński. 2008. “PCDDs/PCDFs, di-PCBs, and HCB in the Flue Gas from Coal Fired CFB Boilers.” *Chemosphere* 73 (2008) 97–103.

Hu, Dingfei, and Hornbuckle, Keri C. “Inadvertent Polychlorinated Biphenyls in Commercial Paint Pigments.” *Environmental Science Technology* (2010) 44: 2822–2827.

Jackson, Kevin, Aries, Eric, Fisher, Raymond, Anderson, David R., and Parris, Adrian, “Assessment of Exposure to PCDD/F, PCB and PAH at a Basic Oxygen Steelmaking (BOS) and an Iron Ore Sintering Plant in the UK.” *Annals of Occupational Hygiene* (2012) 56: 37–48.

Kakareka, Sergey, and Tamara Kukharchyk. “Sources of Polychlorinated Biphenyls Emissions.” *EMEP/CORINAIR Guidebook* (2005) 2.1.

Knauf Shaw (Knauf Shaw LLP). 2018. *Lennox Site Dossier.* Rochester: Knauf Shaw.

Knauf Shaw (Knauf Shaw LLP). 2018. *Lennox Site Dossier Exhibit A.* Rochester: Knauf Shaw.

Knauf Shaw (Knauf Shaw LLP). 2018. *Lennox Site Dossier Exhibit B.* Rochester: Knauf Shaw.

Kuzu, Levent, S., Saral, Arslan, Demir, Selami, Coltu, Hatice, Can, Merve, and Beyaz, Tugba, “Estimation of atmospheric PCB releases from industrial facilities in Turkey.” *Atmospheric Pollution Research* (2013) 4: 420–426.

Lennox (Lennox International). “Our Heritage of Innovation.” Accessed July 11, 2019. https://www.lennoxinternational.com/home/AboutUs/History.html.

MadeHow. “How Products are Made. Volume 7: Furnace.” Accessed July 11, 2019. http://www.madehow.com/Volume-7/Furnace.html.

NYSDEC (New York State Department of Environmental Conservation) and EPA (U.S. Environmental Protection Agency). 2015. *Record of Decision, Operable Unit 2 of the General Motors – Inland Fisher Guide*. Salina: NYDEC and EPA.

RACER (Revitalizing Auto Communities Environmental Response). 2018. Amended Complaint Civil Action No: 5:18-cv-01267-DNH-ATB. U.S. District Court Northern District of New York.

Slater, Lawrence M. 1996. *Commonwealth v. Sak Recycling Corporation, et al.*

USDOT (U.S. Department of Transportation). 1984. *Polychlorinated Biphenyls (PCBs) in Transit System Electrical Equipment.*

Evidence Summary Memorandum for Lennox Site

USGS (U.S. Geological Survey). 1957. Syracuse East Quadrangle New York-Onondaga Co. Source File: 1957 Topo Map showing Lennox location.

Wu, Edward Ming-Yang, Wang, Lin-Chi, Lin, Sheng-Lun, and Chang-Chien, Guo-Ping, "Validation and Characterization of Persistent Organic Pollutant Emissions from Stack Flue Gases of an Electric Arc Furnace by Using a Long-Term Sampling System (AMESA®)." *Aerosol and Air Quality Research* (2014) 14: 185–196.